5.6 EARTH RESOURCES

A geotechnical assessment of the site was prepared for the project by Pacific Soils Engineering (PSE), February, 1998. PSE also completed a Phase I Assessment of the property in January 1997. Findings of the reports are summarized below. The full text of the reports is included in Appendix E of this EIR.

Additionally, it should be noted that PSE completed a study in April, 1997 which was reviewed by the County of Orange. This study addressed only the "remedial grading" portion of the project. The revised February, 1998 study addresses implementation of the full project as described in Section 3.0 of this EIR. The County comments on the original report have been addressed in the revised study and a response memo contained within Appendix E.

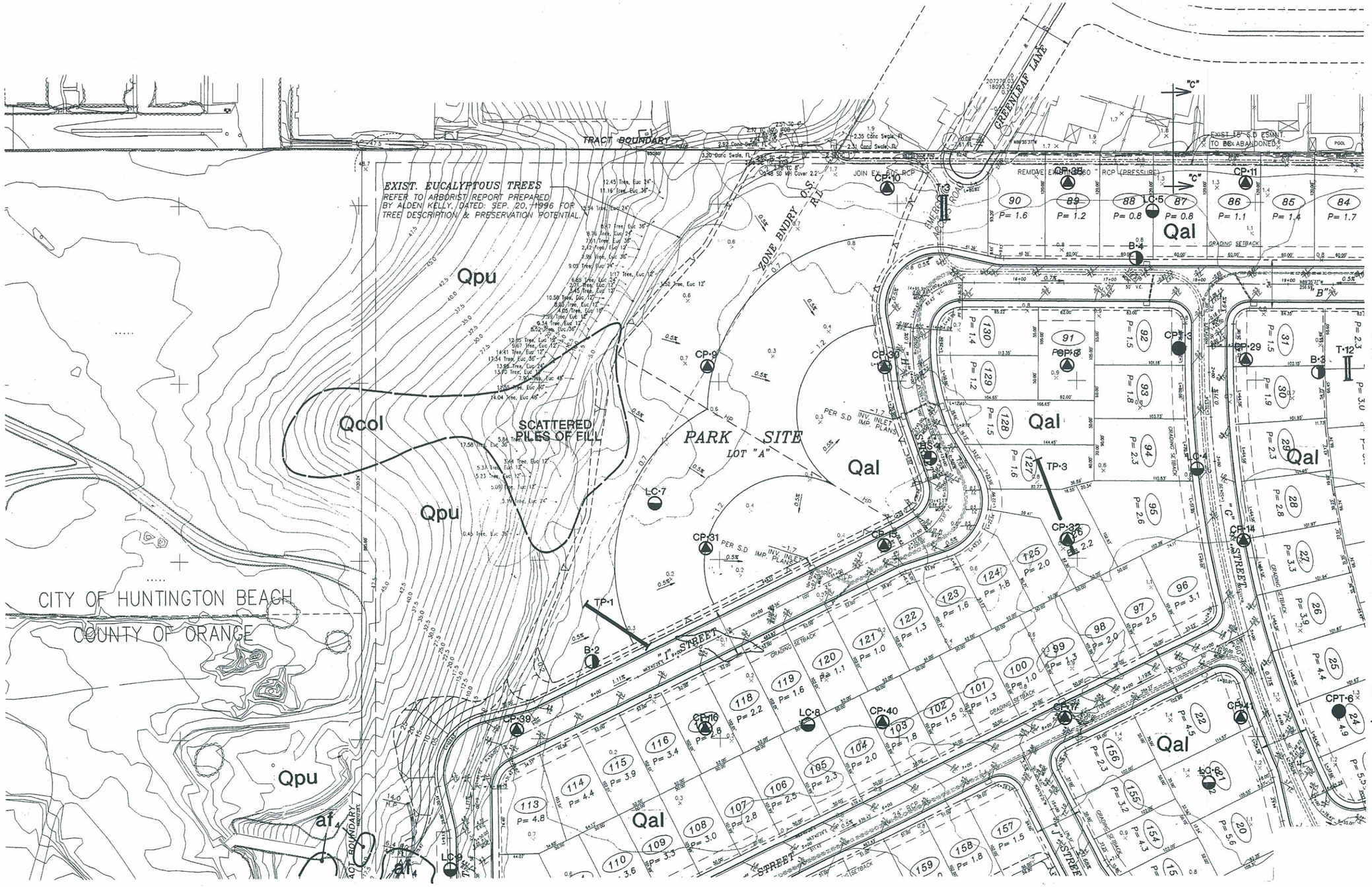
EXISTING CONDITIONS

Site Investigation

Several geotechnical studies were previously performed on this site prior to PSE's current field exploration. The first investigation was performed in 1986 by LeRoy Crandall and Associates (LCA). A second investigation was performed by Stoney-Miller Consultants, Inc. (SMC). A total of 18 exploratory borings and 5 trenches were excavated, logged, and sampled as part of those previous field investigations. The above mentioned studies as well as others are referenced in Appendix I of the PSE report contained in Appendix E of the EIR. Appendices III and IV of the PSE report present excavation logs and laboratory data, respectively, from the above referenced reports.

PSE conducted a supplemental field investigation which was comprised of the excavation, logging, and sampling of eight (8) exploratory borings, twelve (12) test pits, and sixty-five (65) cone penetrometer test (CPT) soundings within the limits of the subject site. The CPT soundings were performed to specifically address the potential for on-site liquefaction. The approximate locations of the subsurface explorations are shown on Exhibits 38-41 Boring/Test Pit Location Maps 1-4.

The CPT's were advanced to depths ranging from ±21 to ±51 feet below existing site grades. Detailed logs of the CPT's and a summary of the equipment used are presented in Appendix E. The test pits were excavated with a rubber-tired backhoe to depths ranging from 6± to 15± feet. The CPT soundings were performed to depths ranging from 31± to 60± feet. Details of the drilling and Logs of Borings are presented in Appendix III of the geotechnical report contained in Appendix E of this EIR.



Scale: (approx.) 1"=100'

Legend

- af_1 – FLOOD CONTROL CHANNEL EMBANKMENT
- af_2 – FILL MOUNDS ADJACENT TO THE FLOOD CONTROL CHANNEL
- af_3 – READILY OBSERVABLE FILL MANTLE RESULTANT FROM SITE DEMOLITION
- af_4 – MISCELLANEOUS MAPPABLE FILL DEPOSITS (MAIN ROAD AND PAD FILL)
- af_5 – GRAHAM STREET FILL EMBANKMENT
- Qsl – POSSIBLE SMALL SLUMP
- Qal – ALLUVIUM
- Qcol – COLLUVIUM
- Qpu – UPPER PLEISTOCENE DEPOSITS
- –?– – GEOLOGIC CONTACT APPROXIMATELY LOCATED; QUERIED WHERE INFERRED
- ⊕ – HORIZONTAL BEDDING
- HS-8 – APPROXIMATE LOCATION OF BORING BY PACIFIC SOILS ENG., INC.
- T-12 – APPROXIMATE LOCATION OF TEST PIT BY PACIFIC SOILS ENG., INC.
- CPT-7 – APPROXIMATE LOCATION OF CPT BY PACIFIC SOILS ENG., INC.
- CP-58 – APPROXIMATE LOCATION OF CPT BY PACIFIC SOILS ENG., INC. (3/24/97–3/28/97)
- LC-10 – APPROXIMATE LOCATION OF BORING BY LEROY CRANDALL AND ASSOC.
- B-8 – APPROXIMATE LOCATION OF BORING BY STONEY-MILLER CONSULTANTS, INC.
- TP-5 – APPROXIMATE LOCATION OF TRENCH BY STONEY-MILLER CONSULTANTS, INC.

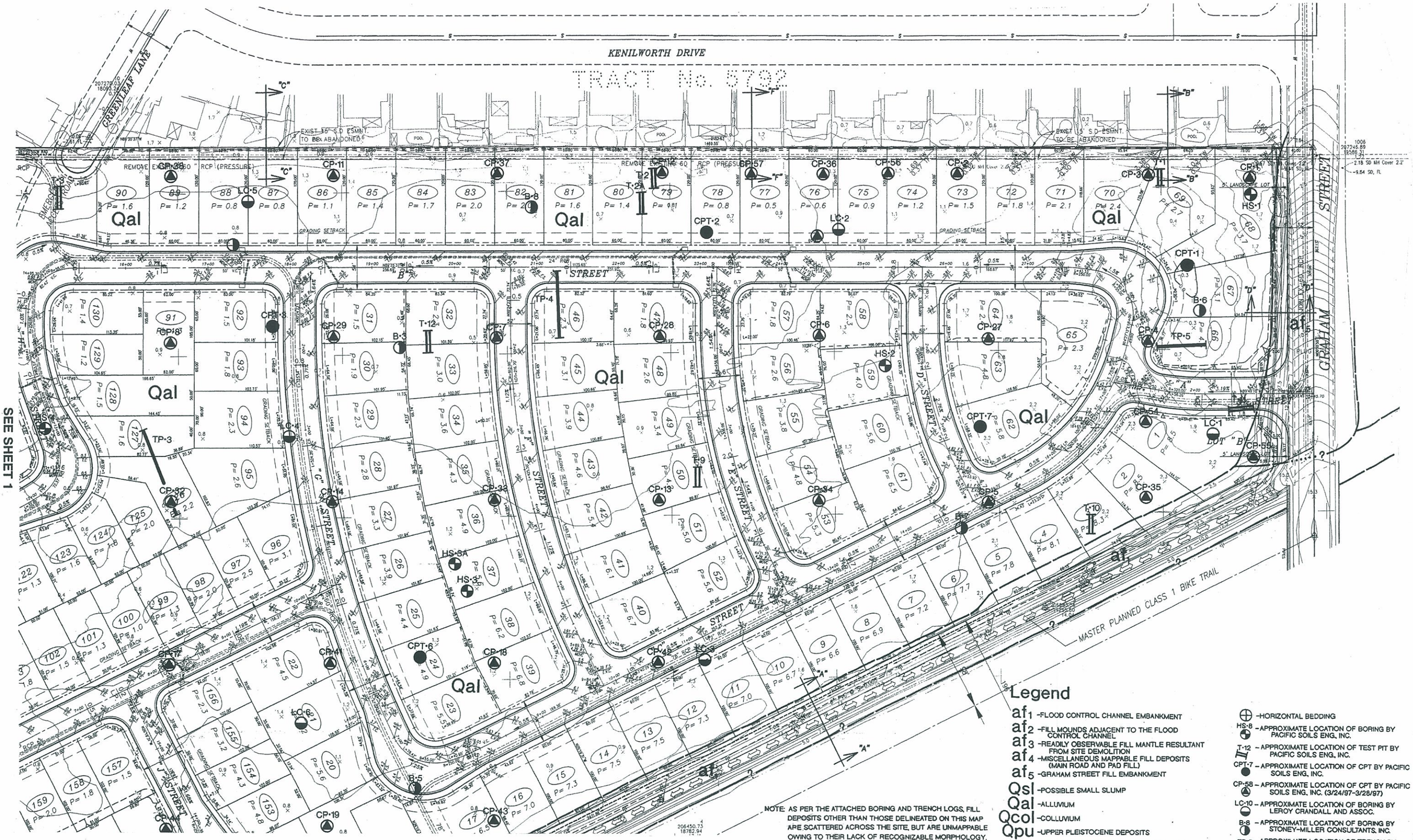
NOTE: AS PER THE ATTACHED BORING AND TRENCH LOGS, FILL DEPOSITS OTHER THAN THOSE DELINEATED ON THIS MAP ARE SCATTERED ACROSS THE SITE, BUT ARE UNMAPPABLE OWING TO THEIR LACK OF RECOGNIZABLE MORPHOLOGY OR THEIR SMALL SCALE.

EDAW, Inc.

Source: Pacific Soils Engineering, Inc.

Exhibit 38

Geologic Map with Boring/Test Pit Locations (1 of 4)



Scale: (approx.) 1"=100'

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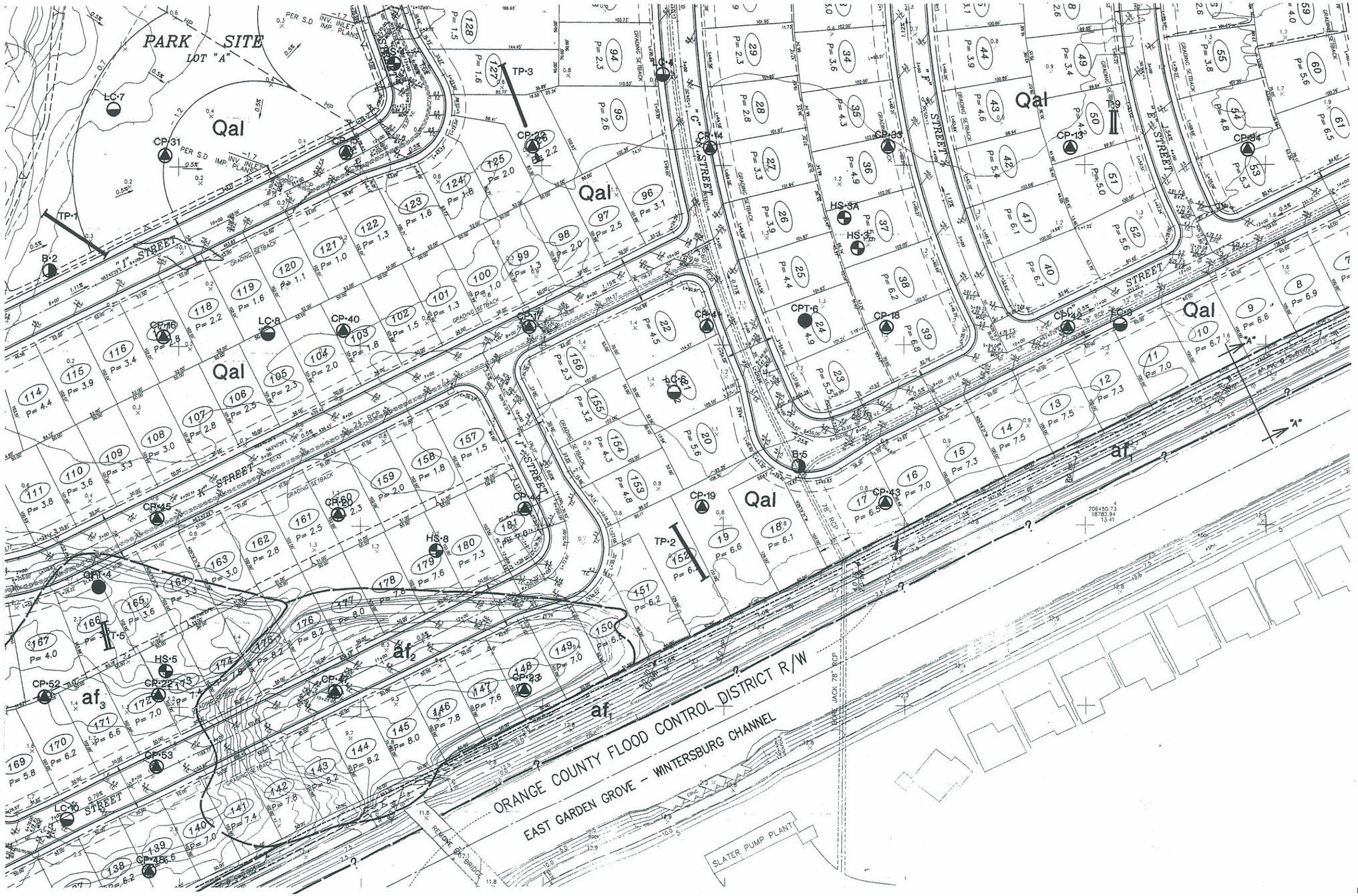
EDAW, Inc.

Source: Pacific Soils Engineering, Inc.

Exhibit 39

Geologic Map with Boring/Test Pit Locations (2 of 4)



Legend

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- af_2 – FILL MOUNDS ADJACENT TO THE FLOOD CONTROL CHANNEL
- af_3 – READILY OBSERVABLE FILL MANTLE RESULTANT FROM SITE DEMOLITION
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- af_5 – GRAHAM STREET FILL EMBANKMENT
- Qsl – POSSIBLE SMALL SLUMP
- Qal – ALLUVIUM
- Qcol – COLLUVIUM
- Qpu – UPPER PLEISTOCENE DEPOSITS
- ? – GEOLOGIC CONTACT APPROXIMATELY LOCATED; QUERIED WHERE INFERRED

- ⊕ – HORIZONTAL BEDDING
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- B-8 – APPROXIMATE LOCATION OF BORING BY STONEY-MILLER CONSULTANTS, INC.
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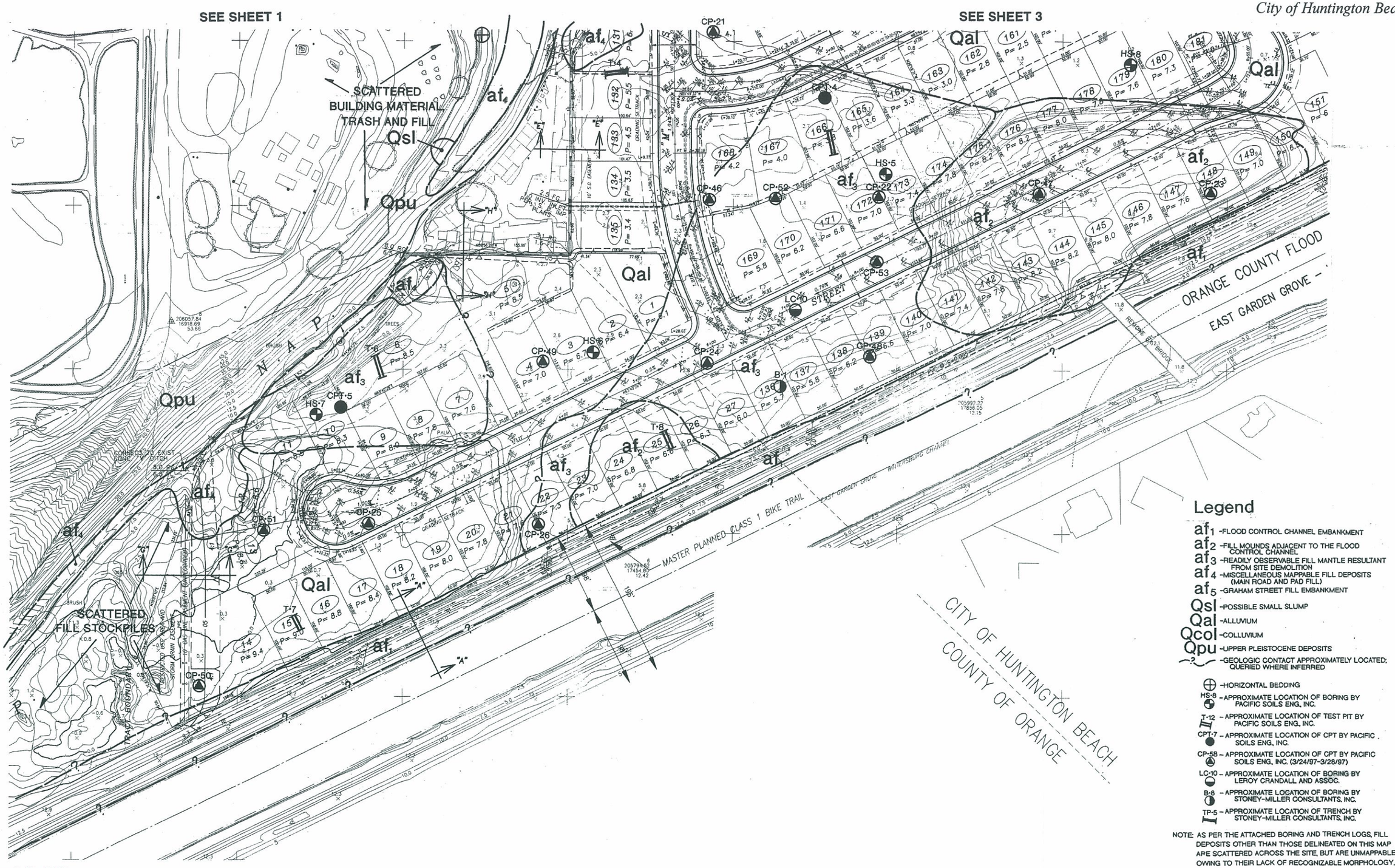
Scale: (approx.) 1"=100'

EDAW, Inc.

Source: Pacific Soils Engineering, Inc.

Exhibit 40

Geologic Map with Boring/Test Pit Locations (3 of 4)



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- Qsl -POSSIBLE SMALL SLUMP
- Qal -ALLUVIUM
- Qcol -COLLUVIUM
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- CPT-7 – APPROXIMATE LOCATION OF CPT BY PACIFIC SOILS ENG., INC.
- CP-58 – APPROXIMATE LOCATION OF CPT BY PACIFIC SOILS ENG., INC. (3/24/97-3/26/97)
- LC-10 – APPROXIMATE LOCATION OF BORING BY LEROY CRANDALL AND ASSOC.
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Scale: (approx.) 1"=100'

EDAW, Inc.

Source: Pacific Soils Engineering, Inc.

Exhibit 41

Geologic Map with Boring/Test Pit Locations (4 of 4)

In addition to the three existing piezometers installed by SMC, four monitoring wells were installed in selected borings excavated as part of the PSE investigation. Wells were installed in HS-3A, HS-4, HS-6, and HS-8 as noted Exhibits 38-41 on the boring logs contained in Appendix E. The wells vary in depth from 20± to 40± feet and were constructed with 2-inch diameter slotted PVC pipe, and the upper 10 feet consisted of solid pipe. The slotted portion of the pipe was covered with a permeable membrane which acts as a filter to minimize migration of fine-grained soils into the well. The excavation was backfilled with clean sand and capped with native soils.

Laboratory tests were performed on selected representative soil samples as an aid in soil classification and to evaluate the engineering properties of the soils. The geotechnical laboratory testing program included determinations of moisture content and dry density, Atterberg limits, grain size, expansion potential, shear strength (direct shear), settlement potential (consolidation), compaction (maximum density/optimum moisture), R-value (a test developed by the State of California to evaluate the support characteristics of subgrade soils). and soil corrosivity. Laboratory testing procedures and results are summarized in Appendix IV of the PSE report located in Appendix E of the EIR.

Topography/Site Conditions

The site is virtually flat ranging in elevation from near sea level to a few feet above sea level except for the bluff that rises approximately 50 vertical feet outside the westerly boundary and a fill embankment that rises up to 12 feet along the easterly and southerly boundaries. Fill soils have been spread several hundred feet on-site, extending away from the bridge crossing of East Garden Grove - Wintersburg Channel.

Past land use has been agricultural. Remnants of a stable area are located in the southwesterly portions of the site. A 60-inch storm drain is located near the northerly site boundary at a depth of approximately 6 to 9 feet below grade. A gas pipeline is present near the westerly site boundary.

Stratigraphy/Subsurface Soils

The subject property is within the Bolsa Gap which is a flood plain that is bounded on the west by Bolsa Mesa and on the east by Huntington Mesa (Poland and others, 1956). Native materials beneath the site have been mapped as Quaternary alluvium and include intertidal marsh and channel deposits consisting of clays, silts, some sand and occasional peat beds. Upper Pleistocene deposits have been mapped along the bluff in the western portion of the property. These deposits include marine and terrestrial terrace deposits. Appendix E includes a discussion of the Pleistocene and Holocene deposits that were laid down upon older sedimentary rocks, and represent the project's areas modern geomorphic environments.

The near-surface soils onsite consist of both fills from recent site use and alluvial sands, silts, and clays, in varying proportions, to the depths explored by PSE. The fills exist in the form of loose, uncompacted material adjacent to the bridge over the East Garden Grove - Wintersburg Channel and remnants of past agricultural and stable use. The alluvial deposits are intertidal and tidal, and consist of loose, silty sands, non-plastic sandy silts, clayey silts of low plasticity, and occasional silty to lean clays. The upper sands and silts are typically loose to medium dense, moist to wet and are considered compressible and potentially susceptible to liquefaction. The fine-grained clayey silts and clays are moist to very moist, soft to firm, are considered compressible but not subject to liquefaction. Groundwater in the form of perched seepage has been encountered at various elevations between the surface and a depth of ten feet depending largely upon seasonal introduction of surface water and the presence and configuration of interbedded seams of highly permeable sands and less permeable fine-grained soils. Groundwater depths are discussed later in this Section.

Peat was encountered in the upper five feet in the previous investigations and in the vicinity of borings B-2, LC-3, LC-5, LC-7 and LC-10 as well as test pits TP-3 and TP-4. Refer to Exhibits 38-41. Only minor deposits of peat were observed during the PSE investigation. Significant deposits of peat have not been observed below approximate elevation minus 5 feet.

Organic (peat) deposits in the upper 5 feet reportedly exist to a thickness of as much as two (2) to three (3) feet and, where present, could produce additional settlements of several inches over the life of the project. Inorganic sands, silts and clays will begin an immediate response to applied loads and significant soil settlements will continue for 1 to 4 months after loading, depending upon the load, the thickness of compressible layer, and location of more permeable drainage layers (i.e., sands).

Dense sands and gravelly sands were encountered at depths ranging from 30 feet below grade at B-7 to over 40 feet below grade at CP-24. Refer to Exhibits 38-41. According to PSE, these deposits are neither highly compressible nor subject to liquefaction.

Seismicity

The active Newport-Inglewood fault zone (N-I) is the dominant geologic structural feature of the Orange County coastal plain (Barrows, 1974). The N-I is characteristically a right-lateral strike-slip fault, one of several northwest-trending continental borderland faults that extend from the Mojave Desert in the east to beyond the Channel Islands in the west (Fischer and Mills, 1991). Several discrete strands form the N-I in the Bolsa Gap. The North Branch of the N-I, ~~of~~ which ***is*** ~~two are~~ germane to the geotechnical analysis of the study site, is about 0.4 mile south of the study site, has been demonstrated to be active (Grant, et al., 1995; Law/Crandall, 1994), and has been placed in an Alquist-Priolo (A-P) Zone (State of California, 1986), which mandates site-

specific fault rupture hazard investigations. That Zone does not encroach onto the project site. The North Branch of the N-I is considered capable of producing moderate to large earthquakes; such as the M6.3 "Long Beach" earthquake that was centered on the N-I near Newport Beach. The potential for such an earthquake on the N-I is the most important element in the seismic hazard analysis summarized below and contained in Appendix II of the PSE report.

Potential for Ground Rupture

Faults have not been reported within the project site and the site does not lie within an Alquist-Priolo Special Studies Zone of the State of California (Hart, 1994, State of California, 1986). Therefore, ground rupture due to faulting is considered unlikely at this site.

Strong Ground Motion Potential

The project site, like all property in Southern California, is subject to strong ground shaking due to earthquakes on nearby faults. The Newport-Inglewood Fault Zone is interpreted as having the potential for generating the highest on-site ground accelerations at the project site. Two methods of analysis are traditionally used to estimate ground accelerations generated by hypothetical earthquakes along regional and local faults: (1) deterministic and (2) probabilistic analysis. Both were used by PSE; and both are acceptable analytical methods. The deterministic approach usually yields higher hypothetical ground accelerations than the probabilistic. A detailed discussion of these methods is provided in Appendix II of PSE's report contained in Appendix E of this EIR.

The probabilistic analysis performed by PSE yielded acceleration of about .39g for the 475-year exposure period and about .25g to .28g (say .26g) for the 200-year period. The deterministic analysis yielded .6g for a "maximum probable" event and .75g for the "maximum credible" event.

Liquefaction and Seismic Settlement

Soil liquefaction is a phenomenon in which saturated cohesionless soils undergo a temporary loss of strength during severe ground shaking and acquire a degree of mobility sufficient to permit ground deformation. In extreme cases, the soil particles can become suspended in groundwater, resulting in the soil deposit becoming mobile and fluid-like. Liquefaction is generally considered to occur primarily in loose to medium dense deposits of saturated soils. Thus, three conditions are required for liquefaction to occur: 1) a cohesionless soil of loose to medium density; 2) a saturated condition; and 3) rapid large strain, cyclic loading, normally provided by earthquake motions.

The major factors affecting the susceptibility of a site to liquefaction are:

- Stress history of the site soils.
- Grain size of the site soils.
- Magnitude and duration of ground shaking.

Simply stated, saturated, loose, cohesionless sands are most susceptible to liquefaction, with susceptibility increasing with lower density, lower confining stress, and increased ground shaking. Dense gravels and deposits with significant cohesion from fine-grained (clay) fractions are typically not susceptible. Silty sands, sandy silts, and medium dense to dense sands may be susceptible depending upon the interrelationship of the variables discussed above.

Liquefaction can manifest itself in various forms. In the extreme case, ground surface rupture, sand boils, and slope failure can occur. Only when the development of liquefaction is sufficiently extensive and shallow enough in proximity to the ground surface do the manifestations become significant. If the mantle of non-liquefiable soil above a liquefiable soil is sufficiently thick, the uplift forces will not be sufficient to produce surface manifestation even if liquefaction occurs in the deeper deposits. Thin, discontinuous layers of liquefiable soil are less likely to produce surface manifestations than thick, continuous layers.

Potentially liquefiable soils have been identified to exist at the subject site. For the most part, these potentially liquefiable strata consist of sands and silts that exist in the upper 30 to 35 feet on the site and are interbedded with more cohesive clayey silts and silty clays that are not susceptible to liquefaction. The most significant variable in assessing liquefaction of this site is the selection of an appropriate design acceleration. Arguments can be made for utilization of site accelerations for liquefaction analyses varying from 0.27g to as much as 0.73g depending upon the analytic approach and the level of risk that is deemed appropriate.

For liquefaction analysis, an estimated maximum ground acceleration of 0.5 g was used by PSE. This level of ground shaking could be experienced at the site as a result of a Magnitude 7.0 earthquake on the Newport-Inglewood Fault, located approximately 0.4 miles from the site.

The CPT soundings identified sandy silts to silts and clays as the primary constituents of the on-site alluvium with local potentially liquefiable coarse-grained lenses and layers. Surface expression of liquefaction of the underlying soils is probable without site remediation. Some seismically induced settlement of the potentially liquefiable zones, on the order of 1 to 4 inches, can be anticipated under the assumed design earthquake after the "remedial grading" is completed. Therefore, the "remedial grading" component of the project as described in Section 3.0 of this EIR was developed in response to the on-site potential for surface expression of liquefaction. The detailed ***discussion*** of remedial grading and foundation design are discussed under the Impacts Section.

Tsunamis (Seismic Sea Waves)

Tsunami is a term used to define the water gravity waves most commonly associated with submarine seismic disturbances. Tsunamis can also be generated by underwater volcanic explosions and landslides. The California coast has experienced only small, dampened tsunamis derived from much larger ones that have inflicted substantial damage to the Japanese coast from seismic activity of the Pacific-Eurasian plate boundary in the Western Pacific. Tsunamis on the east side of the Pacific Rim have affected the coast of California. Since 1812, there have been five major tsunamis. The Alaskan earthquake of 1964 which had a magnitude of M_s9.1 was the most significant (Bernard and Goulet 1981).

According to the City of Huntington Beach, and because of the present low elevation, the site is considered moderately susceptible to Tsunami run-up.

Seiches

The potential for damage from seiches (seismically induced waves on inland bodies of water) is considered low. The only reasonable sources are the adjacent storm channel which could overtop if a large earthquake occurred locally, and when the channel is filled to capacity; or, in a worst case scenario, if Prado Dam (a structure built to control floods along the Santa Ana River) were to overtop or fail during a large earthquake, when the appurtenant reservoir is filled. Those probabilities seem low.

Subsidence

Regional subsidence has been reported in the literature (for example, Law/Crandall, 1980; City of Huntington Beach, 1995). Law/Crandall indicates that parts of the region underwent about 10 feet of subsidence, probably resultant from water extraction and oil withdrawal from the Huntington Beach oil field (in which the site is in close proximity). However, the rate of subsidence decreased to a rate of about .01 foot per year as oil production has decreased and as water injection of the oil field has increased. The City of Huntington Beach also expects the rate to decrease. Peat oxidation can also give rise to subsidence, but generally occurs on a more localized level.

Ground Water

Groundwater was encountered in the exploratory borings and were generally at six (6) feet below ground surface (bgs). Based on previous work done on the site (1988 and 1996), groundwater was reported to be between four (4) to six (6) feet bgs and between 10 to 19 feet bgs. Variations in the semi-perched water levels may be attributed to local mining of water, seasonal

fluctuations, local drainage devices ("Slater Drain" of Bolsa Chica EIR, 1996), or perhaps faulty measurements. The proposed project will require localized subsurface dewatering prior to and during construction.

Hazardous Materials

A Phase I Environmental Site Assessment (ESA) has been completed by PSE. This ESA was conducted in general accordance with ASTM Standard E-1527 as per an agreement with Shea Homes. The purpose of the Phase I ESA is to evaluate recognized environmental conditions on and near the subject property. Environmental conditions are evaluated with respect to environmental contaminants defined by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and petroleum products. In addition, previous property use is evaluated.

No oil wells occur on the property based on a review of oil field maps. The Sunset Beach oil field is to the west and the Huntington Beach oil field is to the south.

Federal and State environmental data bases were searched to determine whether documented environmentally impacted sites occur on or near the property. A copy of the records search is included as Appendix 8.2 of the Phase I assessment. A site under review by the State of California Environmental Protection Agency (CAL EPA), leaking underground storage tank (LUST) sites, solid waste landfill site (SWLF), registered underground storage tank (UST) sites, sites under review by the Orange County Health Care Agency and hazardous waste generators are listed within 1.25 miles of the property.

The Steverson Bros. Boucher Site is under review by CAL EPA. This site is northwesterly of the property. A preliminary assessment is in progress for this site.

According to PSE, it is considered unlikely that the property has been adversely affected by the documented environmentally impacted sites. The Boucher Landfill is the nearest environmentally listed site and is located off-site to the northwest. This landfill has been closed and is considered to pose minimal public risk by the Department of Toxic Substances Control. Public risk was calculated using conservative assumptions. Refer to Reference 1 of the Phase I assessment. The Cabo Del Mar condominium complex has been developed on the landfill site. This landfill was approximately 500 feet northerly of the northwest property corner.

A large steel tank was observed off-site adjacent to the western property boundary. The tank did not appear to be in use and no evidence of chemical spillage was observed by PSE. Due to the sites past agricultural use, residual pesticide levels may be present in the soil. The property is within Orange County which has been designated as a Radon Zone 3 area. Radon gas levels have been estimated to be below 2 picocuries per liter (pCi/l). Picocurie is a standard measure for

radioactivity, specifically the rate of decay for a gram of radium - 37 billion decays per second. A picoCurie (pCi) is one trillionth of a Curie. Picocurie per Liter is a unit of radioactivity corresponding to one decay every 27 seconds in a volume of one liter, or 0.037 decays per second or 2.2 decay per minute in every liter of air containing 1 pCi/l. The EPA action level for radon gas is 4 pCi/l.

IMPACTS

Appendix G of the CEQA Guidelines serves as a guideline/general example of consequences that are deemed to have a significant effect on the environment. A project may be deemed to have a significant effect if it will:

(r) Expose people or structures to major geologic hazards.
(v) Create a potential public health hazard to people or animal or plant populations in the area affected.

For the purposes of this EIR, significant geologic hazards are considered geologic conditions that cannot be overcome by design using reasonable construction and/or maintenance practices in future development that will occur with implementation of the proposed project. The impacts related to the above stated criteria are discussed below.

Soils

The project site is composed of alluvial deposits of sands, clays, silty clay. Undocumented fills and peat deposits have also been encountered on the site in the past. On-site silts and peat deposits are highly compressible. Excavations at the site will include removal of existing compressible soils, undocumented fills, disturbed soils during grading and any peat layers encountered, footing excavations and trenching for utility lines. Compressible soils not detected and mitigated prior to construction may severely damage structural foundations.

Significant settlements of peat deposits within the upper 5 feet could continue over the design life of the structures without mitigation in the form of removal and/or surcharge. This is considered a significant impact. Mitigation Measures 1 and 2 along with the "remedial grading" component of the project will reduce this impact to a level less than significant.

The potential exists for significant impacts from the on-site mildly to severely corrosive soils. Mitigation Measures 1 and 2 require implementation of the PSE recommendations which will reduce potential impacts from corrosive soils to a less than significant level.

The majority of on-site soils possess poor to moderate pavement subgrade support characteristics with R-values estimated to typically range from 10 or below to on the order of 20 (a "good" R-value would be anything above 50). Depending upon the final distribution of site soil as well as the nature and distribution of import soils, pavement support characteristics could similarly vary. Mitigation Measures 1 and 2 shall be implemented to ensure potential impacts from soils with poor pavement support characteristics are reduced to a level less than significant level.

The native site soils within the potential zone of influence of structures possess relatively low shear strength at existing moisture and density conditions. Fills, compacted to project standards, at or slightly above optimum content, will exhibit substantially higher shear strength characteristics and can be expected to provide suitable bearing support to typical shallow foundation systems. Deep foundations, if employed, shall be designed to develop support within the dense sands that exist below 30 to 50 feet. Mitigation Measures 1 and 2 (along with the "remedial grading" component of the project) will ensure potential impacts resulting from soils with low shear strength are reduced to less than significant levels.

The upper site soils, including existing fills and alluvial deposits, can be expected to undergo shrinkage on the order of 10 to 15 percent when excavated and reused as compacted fill. In addition, shrinkage from settlement of one inch should be expected for each one foot of design fill to be placed. Peat has been identified on-site with locally significant concentrations in the vicinity of borings B-2, LC-3, LC-5, LC-7, and LC-10 (Exhibits 38-41). Thick (>3 inches) concentrations of this material will require separation and off-site disposal while less significant concentrations (0 to 3 inches thick) will likely be adequately scattered and mixed during site remediation so as to be insignificant. Mitigation Measures 1 and 2 (along the "remedial grading" component of the project) will ensure potential impacts resulting from soil shrinkage are reduced to less than significant levels.

Seismicity

Potential for Ground Rupture

No active or potentially active faults are known to exist on the site. There are no impacts associated with ground surface rupture on the project site.

Strong Ground Motion Potential

The project site is located in a seismically active area where significant ground shaking from local earthquakes can be expected. One active fault (the Newport-Inglewood) is located 0.4 miles from the project site. Ground shaking impacts on the project site are considered to be moderate to high due to the proximity of known active faults within the region. Development of the proposed project may expose structures or persons to impacts associated with ground shaking. Seismic

design of the proposed development will be in accordance with Uniform Building Code criteria. Mitigation Measures 1 through 3 (along the "remedial grading" component) will reduce impacts due to ground shaking to a level less than significant.

Liquefaction and Seismic Settlement

In April 1991, the State of California enacted the Seismic Hazards Mapping Act (Public Resources Code, Division 2, Chapters 7-8). The purpose of the Act is to protect the public safety from the effects of strong ground shaking, liquefaction, landslides, or other ground failure. The Act defines mitigation as "...those measures that are consistent with established practice and reduce seismic risk to acceptable levels." Acceptable level of risk is defined as "that level that provides reasonable protection of the public safety, though it does not necessarily ensure continued structural integrity and functionality of the property [California Code of Regulations; Section 3721(a)]."

In the context of that Act, mitigation of the liquefaction potential at this site to appropriate levels of risk (i.e., level less than significant under CEQA) can best be accomplished by a combination of grading and foundation design alternatives. The recommendation criteria are to 1) perform overexcavation and recompaction of surface soils, in conjunction with placement of design fills, to provide sufficient non-liquefiable soil above potentially liquefiable soils such that ground surface manifestation is precluded, and 2) design improvements to withstand up to 2-inches of differential settlement.

The data from the 65 CPT Soundings, conducted by PSE, as well as other data developed by previous consultants, has been used to evaluate potential liquefaction occurrence and seismic settlement at each data point. On the basis of past data and in consideration of proposed site grading, PSE has prepared "remedial grading" recommendations throughout the site that are intended to satisfy the above stated criteria and therefore render the site suitable for residential development. The "remedial grading" has been incorporated as part of the proposed project description. The various depths of recommended overexcavations are indicated in Table I of Appendix E and the grading recommendations are summarized as follows:

> Overexcavate the site to the depths indicated in Table I of Appendix E. Minimally, overexcavation to elevation minus three (-3) feet will be required and locally overexcavation to as deep as elevation minus nineteen (-19) is recommended. Plate 2 of Appendix E is based on an assessment of the overexcavation necessary to extend removals locally below currently proposed storm drain and sewer inverts as geotechnical issues.
>
> Where concentrations of peat are encountered in the overexcavation process, they should be separated and disposed of off-site.

Upon overexcavation to the required depths, the exposed bottom should be sufficiently stabilized to support compaction equipment.

Upon stabilization, fills may be placed and compacted to project specifications until design grades are obtained.

Thus, with the implementation of the "remedial grading" component of the project and grading recommendations which are summarized above and required by Mitigation Measure 1, impacts associated with Liquefaction and Seismic Settlement are reduced to less than significant levels.

Tsunamis (Seismic Sea Waves)

With the implementation of the "remedial grading" component of the project (which raises the site grades), potential impacts from Tsunamis are reduced to a less than significant level.

Seiches

According to PSE, the probability of impacts from Seiches is low and with implementation of the "remedial grading" component of the project (which raises the site grades) and improvements to the CO5 channel as identified in Section 5.7, potential impacts would be mitigated to a less than significant level.

Subsidence

According to PSE, there is a small likelihood that relatively uniform subsidence could ~~contained~~ ***continue*** to occur (after the implementation of remedial grading efforts), but the probability of significant damage to the completed development from, this source is seeming low. Regional groundwater withdrawal and peat oxidation can increase the potential for subsidence. The project grading and construction activities will implement removal of peat soils. As stated above, the project will also require localized dewatering (see below). According to PSE, no subsidence impacts to adjacent properties from the proposed local dewatering are anticipated. Implementation of Mitigation Measure 4 will ensure that the proposed local dewatering does not result in subsidence of adjacent properties along the project's northern property boundary.

Ground Water

The upper site soils are typically moist to wet with perched water currently present at a depth of approximately six feet below existing grade. Depending upon the time of year, free water may be encountered during site grading in soils within approximately 2 feet above the water surface. The soils below that elevation will require drying and mixing in order to be excavated and compacted

to project standards. Water is likely to be at its highest levels during the winter rainy season and at its lowest levels during the summer months.

Excavation of the site soil will be hindered by the presence of perched water and high moisture content soils. The coarser grained sands will generally support excavation equipment, possibly even when saturated, however, the interbedded silts, clayey silts and sandy silts are likely to be unstable when subjected to heavy wheel loads from conventional scrapers. Repeated surface loading with heavy, rubber-tired vehicles tends to "work" moisture to the surface. The project will require subsurface dewatering prior to and during construction. Mitigation Measure 4 is proposed to ensure an appropriate plan for dewatering is implemented. With the implementation of Mitigation Measure 4, no groundwater impacts are anticipated. Potential noise and subsidence impacts which could result from the dewatering activities are discussed in their respective sections of this EIR. Mitigation Measures are recommended to ensure no significant impacts result from the dewatering activities.

Hazardous Materials

Since no oil wells are located on-site, no impacts from this potential hazard would occur. Based on a review of regulatory information, it is considered unlikely by PSE that the property has been adversely effected by the documented environmentally impacted sites near the property. No impacts are anticipated.

The Boucher Landfill site was previously located approximately 500 feet northwest of the northwest property corner. The Cabo Del Mar condominium complex has been developed on this site. The Department of Toxic Substances Control considers the site to pose minimal public risk and an adverse environment impact to the subject property from this site is considered unlikely according to PSE.

Pesticides such as DDT and related compounds were widely applied to agricultural properties from 1944 through 1970. Background residual concentrations of these pesticides are common on agricultural properties. These pesticides if not properly treated/removed would impact the future users of the site. Mitigation Measure 5 requires Phase II environmental soil sampling to determine the residual levels of pesticides in the soil. Implementation of this measure will reduce potential impact to a less than significant level.

The site is within Orange County which has been designated as a Radon Zone 3. Radon levels have been estimated to be below 2 pCi/l, which are below EPA significance level; however, to ensure potential hazards would not occur, Mitigation Measure 6 requires testing to verify the estimated radon levels, subsequent to building. Implementation of this measure will reduce potential impact to a less than significant level.

CUMULATIVE IMPACTS

The proposed project in conjunction with other past, present, and reasonable foreseeable future projects will not result in a cumulative impact related to geology/soils. No cumulative impacts have been identified.

STANDARD CITY POLICIES AND REQUIREMENTS

A. Prior to submittal for building permits, a detailed soils analysis shall be prepared by a registered Soils Engineer. This analysis shall include onsite soil sampling and laboratory testing of materials to provide detailed recommendations regarding grading, chemical and fill properties, foundations, retaining walls, streets and utilities.

MITIGATION MEASURES

1. Prior to the issuance of a grading permit, the recommendations contained in Section 7.0 of the geotechnical study, located in Appendix E of this document shall be incorporated into the earthwork activities of the proposed project to the satisfaction of the City Engineer. Earthwork activities include grading, clearing and demolition, site preparation, unsuitable soil removals, backcuts, excavation processing, compaction of all fills, mixing, benching, inspection, survey control, subgrade preparation, cut and fill slope construction, haul roads, import soils, structural load and settlement/subsidence measures, and storm drain relocation.

2. Prior to the issuance of a building permit, the recommendations contained in Section 8.0 of the geotechnical study, located in Appendix E of this document, shall be incorporated into the structural design of the proposed project to the satisfaction of the City Engineer. Structural design activities include: Foundation Design; Settlements including Foundation Loads and Seismically Induced Settlements; Post-Tensioned Slab/ Foundations; Mat Foundations; Other Foundation Recommendations such as Footing Embedment, Underslab Treatment, and Subgrade Moisture Content; Concrete Driveways, Sidewalks, and Flatwork; Structural Setbacks; Retaining Walls; Other Design and Construction Recommendations such as Lot Drainage, Utility Excavations, Utility Trench Backfill, Corrosion, Metallic Structures, and Concrete Structures.

3. Prior to issuance of a building permit, it shall be proven to the Department of Public Works that all structures are designed in accordance with the seismic design provisions of the Uniform Building Codes or Structural Engineers Association of California to promote safety in the event of an earthquake.

4. Prior to the issuance of grading permits, the applicant shall contract with a dewatering expert to prepare a detailed Dewatering Plan. This plan shall include the placement of monitoring wells ~~along~~ ***near*** the northern property line to evaluate ground water levels during the proposed project dewatering activities. The dewatering activities shall be adjusted immediately if the monitoring wells show ground water level changes which may effect subsidence of adjacent properties. The Dewatering Plan shall be reviewed and approved by the Department of Public Works.

5. Prior to the issuance of a grading permit, Phase II environmental soil sampling shall be conducted to determine the residual levels of pesticides in the soil. If inappropriate/unsafe levels are identified by this analysis, "clean up" measures shall be recommended and implemented. The Phase II sampling and any necessary measures shall be approved by the Department of Public Works.

6. Prior to the issuance of certificates of occupancy, testing to verify the estimated radon gas levels shall be implemented as deemed necessary by the Department of Community Development.

LEVEL OF SIGNIFICANCE

Significant settlements of peat deposits within the upper 5 feet could continue over the design life of the structures without mitigation in the form of removal and/or surcharge. This is considered a significant impact. Mitigation Measures 1 and 2 along with the "remedial grading" component of the project will reduce this impact to a level less than significant.

The potential exists for significant impacts from the on-site mildly to severely corrosive soils. Mitigation Measures 1 and 2 require implementation of the PSE recommendations which will reduce potential impacts from corrosive soils to a less than significant level.

Mitigation Measures 1 and 2 shall be implemented to ensure potential impacts from soils with poor pavement support characteristics are reduced to a level less than significant level.

Mitigation Measures 1 and 2 (along with the "remedial grading" component of the project) will ensure potential impacts resulting from soils with low shear strength are reduced to less than significant levels.

Mitigation Measures 1 and 2 (along the "remedial grading" component of the project) will ensure potential impacts resulting from soil shrinkage are reduced to less than significant levels.

No active or potentially active faults are known to exist on the site. There are no impacts associated with ground surface rupture on the project site.

Mitigation Measures 1 through 3 (along the "remedial grading" component) will reduce impacts due to ground shaking to a level less than significant.

With the implementation of the "remedial grading" component of the project and grading recommendations which are summarized above and required by Mitigation Measure 1, impacts associated with Liquefaction and Seismic Settlement are reduced to less than significant levels.

With the implementation of the "remedial grading" component of the project (which raises the site grades), potential impacts from Tsunamis are reduced to a less than significant level.

Impacts from Seiches is low and with implementation of the "remedial grading" component of the project (which raises the site grades) and improvements to the CO5 channel as identified in Section 5.7, potential impacts would be mitigated to a less than significant level.

Implementation of Mitigation Measure 4 will ensure that the proposed local dewatering does not result in subsidence of adjacent properties along the project's northern property boundary.

With the implementation of Mitigation Measure 4, no groundwater impacts are anticipated.

Mitigation Measures 5 and 6 will reduce potential impacts from hazardous materials to levels less than significant.

The proposed project in conjunction with other past, present, and reasonable foreseeable future projects will not result in a cumulative impact related to geology/soils.

5.7 DRAINAGE/HYDROLOGY

The information contained in this section is summarized from March, 1998 Hydrology and Hydraulics Study and the December, 1997 East Garden Grove - Wintersburg Channel (C05) 100-Year Inundation Study prepared by Hunsaker & Associates. The studies are provided as Technical Appendix F of the EIR.

EXISTING CONDITIONS

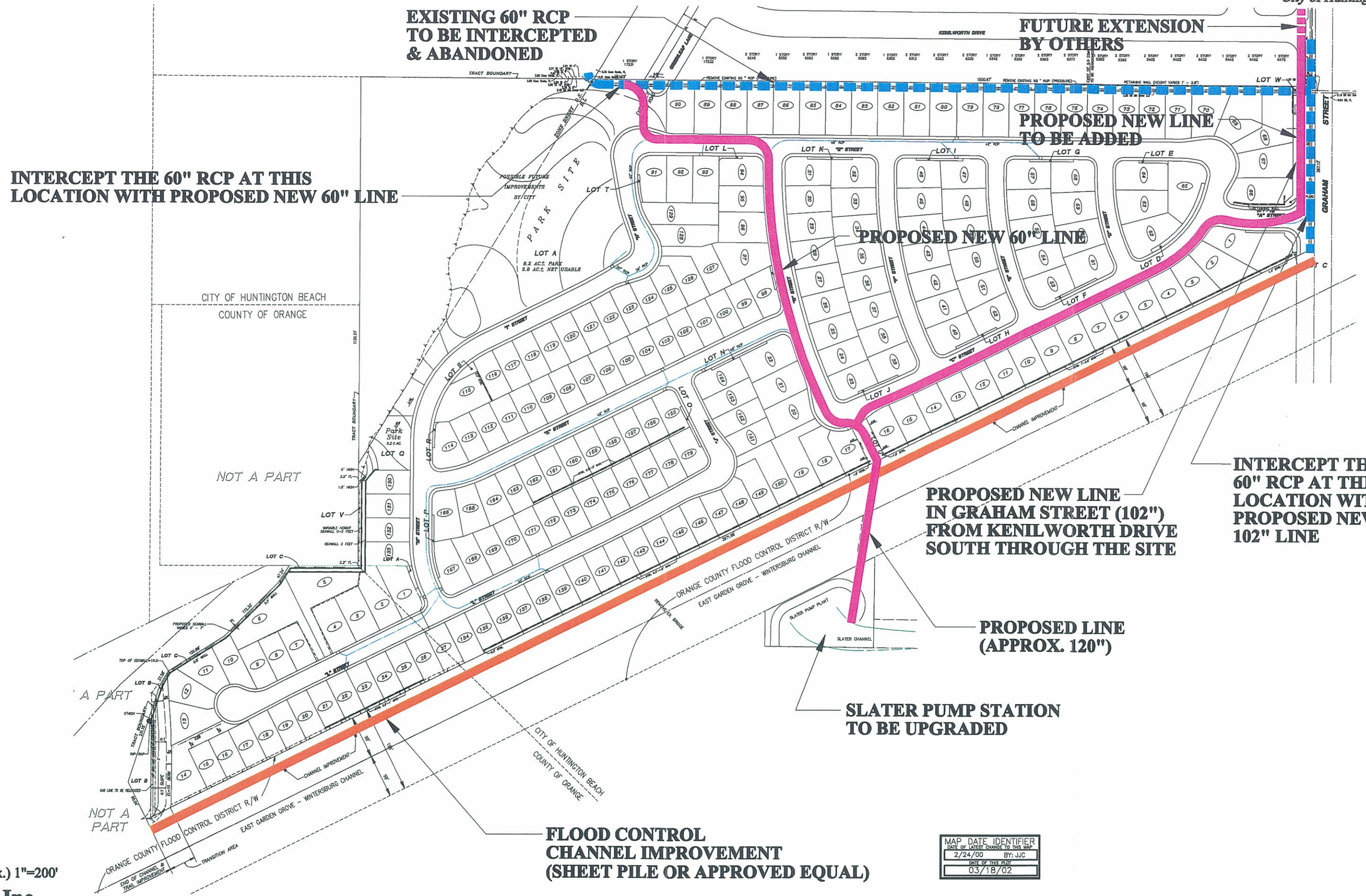
On-Site/Off-Site Drainage

The natural direction of drainage of the project site is from the northeast to the southwest. A majority of the project site is at 0.07 percent slope. Exhibit 42 depicts the existing drainage system for the site and adjacent areas. Existing runoff from the site surface drains southwest; however, there are high points along the southwest boundary of the site which under a 100-year storm prevent flow from exiting the site.

For the purpose of the drainage analysis, a total of 186.9 (off-site) acres was included. The extra acreage is contained within four (4) of five (5) watershed areas tributary to the Graham Street storm drain system. A description of the watershed areas is provided below. Exhibit 43 identifies the site location and indicates the size of each watershed area tributary to the existing Graham Street storm drain system. All areas referred to below are reflected on Exhibit 43.

The area surrounding the site consists of Area Nos. 1 and 2 to the north, and Area No. 5 to the east. These areas currently flow into the Graham Street storm drain system. It should be noted that Area 1 (Tract No. 10853) presently drains into the site at Greenleaf Lane and flows into an existing 60-inch RCP along the northern site boundary where it connects into the Graham Street storm drain. Additionally, Area No. 3, north of Warner Avenue, is tributary to this system and combines with the flow from Area No. 4 (Meadowlark Golf Course) to add to the flow in the Graham Street storm drain system.

The upstream end of the Graham Street storm drain system begins at the intersection of Warner Avenue and Graham Street, where Area No. 3 (after retaining some of its flow within Area No. 4) flows south on Graham Street. The system picks up flows within Area No. 2 at Kenilworth Drive; Area No. 1, at 100± south of Kenilworth (from a 60-inch storm drain located along the north property line of the site) (see Exhibit 42); and Area No. 5, just south of the proposed entry of this site. The flow from Area No. 5 enters the existing storm drain in Graham Street about 400 feet south of Kenilworth Drive. The combined flow from all these areas is carried through the existing system under the East Garden Grove - Wintersburg Channel and flows into the Slater Channel, which flows into the Slater Pump Station and is ultimately pumped into the East Garden Grove - Wintersburg Channel.



Scale: (approx.) 1"=200'

EDAW, Inc.

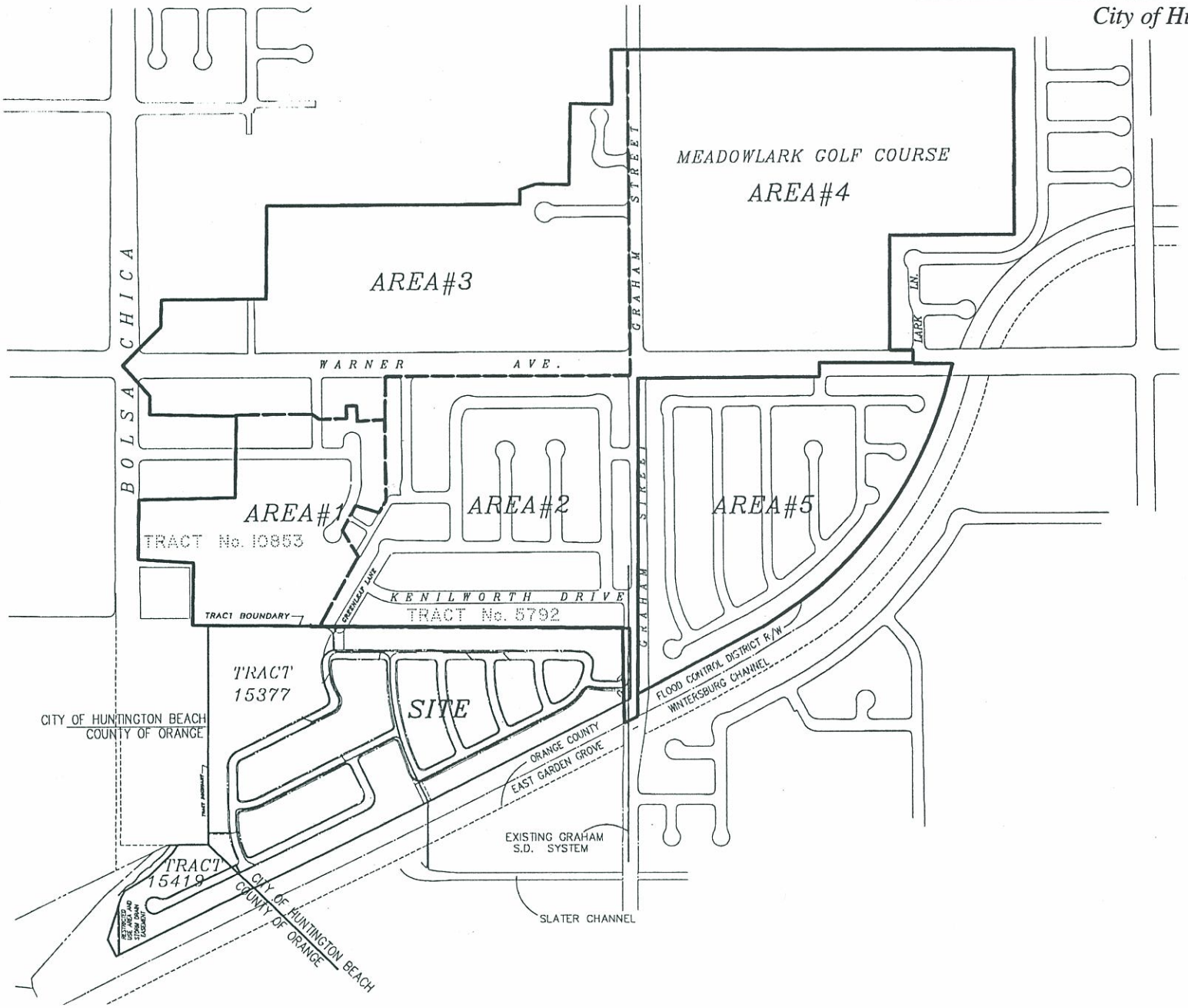
Source: Hunsaker & Associates Irvine, Inc.

Exhibit 42

Existing and Proposed Storm Drain Improvements (206 Lots)

Parkside Estates EIR 97-2

City of Huntington Beach



No Scale

EDAW, Inc.

Exhibit 43

Source: Hunsaker & Associates Irvine, Inc.

Watershed Boundary Map

The existing condition runoff volumes for a 100-year storm event (Q100) for the existing 186.9-acre drainage area and the 49-acre project site are shown in Table W. Advanced Engineering Software (AES) was utilized for estimation of the flows for 100-year return frequency. The results of these calculations are included in Appendix F under sections "100-year Off-Site or On-Site Hydrology" for existing and ultimate conditions. Water Surface Hydraulic Gradient "WSPG" was utilized for hydraulic calculations and the results and an explanation of methodology is included in Appendix F under title "Hydraulic Calculations". The existing drainage area boundaries and node numbers which relate to the calculations in the drainage analysis are shown in Section 3, which is contained in Appendix F of the EIR.

Flooding

The National Flood Insurance Program (NFIP) prepares Flood Insurance Rate Maps (FIRMS) which depict flood hazard areas. The federal program enables property owners to purchase flood insurance based on identified flood hazards in the area. The FIRM map for the area shows that the project site is located within the A99 Flood Zone (Protected by Federal Project under Construction). This A99 Flood Zone is the result of a revision to the previous zone AO. This revision was made by the Federal Emergency Management Agency (FEMA) on April 30, 1996. The Zone A99 designation is used to identify areas that are protected by a Federal flood protection system under construction from a flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) with no base flood elevations (BFEs) determined. The revision to the zone is based on construction of the Santa Ana River Mainstem flood control project, which includes two critical features -- channel and bridge widening and channelization of the Lower Santa Ana River Channel Reaches 1 through 4, and construction of the Seven Oaks Dam. The existing residential uses north of the project site currently experience flooding due to existing deficiencies in the existing Graham Street storm drain system.

Historically, the East Garden Grove - Wintersburg Channel has reached capacity during larger rain storms in the area according to City staff. Based on an analysis performed by Hunsaker & Associates and contained in Appendix F, the East Garden Grove - Wintersburg Channel may experience overtopping in the area from Goldenwest Street westerly to Warner Avenue during a 100-year storm event. The computer program "HEC-2, Water Surface Profiles" by the US Army Corps of Engineers was used in this analysis for computing the 100-year expected water surface evaluation. A split-flow option in the HEC-2 Program was utilized for computing the runoff amounts which overtop the existing CO5 Channel in the 100-year expected peak discharge. For computation procedures, see HEC-2 Water Surface Profiles User Manual, September 1990, and Application of the HEC-2 Split Flow Option Training document No. 18, April 1982.

TABLE W

EXISTING AND PROPOSED RUNOFF VOLUMES FOR A 100-YEAR STORM EVENT

Watershed Areas	Acres	Existing Q100 (CFS)	Proposed Q100 (CFS)	Flow Increase (CFS)	Cumulative Flow Summation (CFS)
1	21.8	77.3	77.3	0.0	77.1
2	40.7	94.5	94.5	0.0	405.5[3]
3	46.0	120.8	120.8	0.0	405.5[3]
4	65.7	166.2[3]	166.2[3]	0.0	405.5[3]
Total Off-Site Flow Accumulation	NA	NA	NA	NA	472.5[4]
Project Site	49.0	0.00[1]	126.1	126.1[2]	NA
Total Off-Site & On-Site Flow Accumulation	NA	NA	NA	NA	598.6
Net Project Increases	NA	NA	NA	NA	126.1[2]

Source: Adams Streeter

1. The City's hydrology map shows 0 runoff from the existing project site under a 100-year flood.
2. This flow will be mitigated by the proposed project's new storm drains and the Slater/Wintersburg Pump Station improvements.
3. This flow figure does not assume any retention within the Medowlark Golf Course.
4. This flow will be intercepted and diverted from the existing Graham Street storm drain through the project sites new storm drains to the Slater/Wintersburg Pump Station. Thus, the capacity of the Graham Street storm drain is increased by this figure.

Note: Sub-areas which are contained within each watershed area are shown in Sections 3 and 4 of Appendix F.

The results of the HEC-2 computer study on a 100-year flood event on a fully developed East Garden Grove - Wintersburg Channel watershed are described below:

- The East Garden Grove - Wintersburg Channel could only carry about 4,200 cfs and would exceed its levees and overflow them in a 100-year flood event.

- There would be no overflow along the channel to the north between Cooper Lane and Marie Lane, View Circle and Summer Cloud Lane, and a portion on either side of Warner Avenue. These areas represent 53% of the total channel.

- The length of time ~~and~~ ***that*** the channel would exceed its existing banks varies with location, but the longest time is about 2 1/2 hours.

- Because the existing south levee is slightly lower than the north levee in most of the area where overtopping occurs, most of the excess runoff flows over the south levee.

- A total of about 52 acre-feet (AF) of water ***could*** ~~will~~ actually overtop the north side of the East Garden Grove - Wintersburg Channel.

Water Quality

Water quality in California is regulated by the US Environmental Protection Agency's National Pollution Discharge Elimination System (NPDES), which controls the discharge of pollutants to water bodies from point and non-point sources. NPDES permits are required for any commercial and/or industrial construction sites. As stated above, the existing site is currently undeveloped. The site has also been in agricultural production since the 1950's. It is anticipated that the existing runoff (minimal) from the site contains concentrations of fertilizers and pesticides associated with the past agricultural uses. These include particulate solids (total suspended solids), nutrients (total nitrogen compounds and phosphates) and oxygen demanding substances (BOD).

IMPACTS

Appendix G of the CEQA Guidelines serves as a guideline/general example of consequences that are deemed to have a significant effect on the environment. A project may be deemed to have a significant effect if it will:

(f) Substantially degrade water quality
(q) Cause substantial flooding, erosion or siltation.

For the purposes of this EIR, a significant impact would occur if implementation of the proposed project would cause or expose people and property to substantial flooding or make worse existing

drainage deficiency problems. The impacts related to the above stated criteria are discussed below. Additionally, a significant impact would occur if implementation of the project would cause a substantial degradation of water quality.

On-Site/Off-Site Drainage

Implementation of the proposed project will alter existing drainage patterns on-site. Surface flows will be redirected to allow for the development of the residential project. The proposed drainage system will convey runoff from the site (approximately 49 acres) through new storm drain lines directly to the existing Slater Pump Station. Beneficial impacts will occur to the Graham Street storm drain system and are discussed below. The proposed Q100 figures for the drainage area of the project site are presented in Table W. The hydraulic calculation results and methodology are included in Appendix F under the title "Hydraulic Calculations". Under a 100-year storm event, the proposed project will result in a total flow increase of 126.1 cfs.

Increased project runoff will be affected by the introduction of an additional 20.5 (50% of residential acreage) acres of impermeable surface areas such as streets, residential driveways, and building pads. Additionally, the proposed condition will include intercepted off-site flows (472.5 cfs) from the Graham Street storm drain. Under a 100 year storm event the proposed project will result in a total increase of 126.1 cfs into the Slater Pump Station. Because the existing areas north of the project currently experience drainage deficiencies, this increase is considered to be significant. The existing facilities are currently not adequate to handle existing runoff and therefore are not adequate to accommodate the increase in project runoff. This is considered a significant impact. An expanded discussion of the necessary mitigation is provided below.

The required hydrology analysis performed by Hunsaker & Associates to determine the increase in storm flow into the Slater Pump Station as a result of the development of this site is discussed below. Several methods were used to determine this increase. The different methods are described in Appendix F of the EIR. ***Please refer to Section 6.7 to Section 6.10, which includes the updated hydrologic study, "FEMA Detailed Flood Insurance Study" prepared by Exponent.*** The following describes the method which provides a more conservative estimate, which yields the most realistic solution.

- The proposed development is required to intercept the Graham Street storm drain system, containing flows from Area Nos. 1, 2, 3, and 4, this would require the drain through the site to be designed to carry the total peak storm flows without any temporary storm water storage within the golf course. It was assumed that the filling of this low area in the golf course would not be permitted until the over-topping of the East Garden Grove - Wintersburg Channel has been eliminated.

- Area 5 will continue to drain into the existing Graham Street drain. With all of the area north of this point taken out of the existing Graham Street drainage system, this area should experience a reduction of flood occurrences.

- The Area 1 flows will be directed through the site, joining with on-site flows before joining with the drain from Graham Street where all the flows will cross under the East Garden Grove - Wintersburg Channel and enter the Slater Pump Station.

The flows that were determined in the hydrology study to enter the site from Graham Street (Area Nos. 2, 3, and 4 = 405.5 cfs) were taken along with the flows from Greenleaf Lane (Area No. 1 = 77.3 cfs) and traveled the Greenleaf Lane flows over to Graham Street, where they were ~~summed~~ ***confluenced*** based on their times of concentration. This resulted in a peak flow rate of 472.5 cfs (for Area Nos. 1, 2, 3 and 4). When this is subtracted from the total peak flow that the entire drainage area, including this site, discharges to the Slater Pump Station (Area Nos. 1, 2, 3, 4 and the site = 598.6 cfs), the result is an increase of 126.1 cfs. The normal peak efficiency of each pump in the Slater Pump Station is about 66,000 gpm (147 cfs). Therefore, one additional pump this size should be more than able to offset any increase in flow caused by the development of this site.

Preliminary pipe sizes required to convey calculated 100-year flows are shown on Exhibit 42 of this EIR and with the implementation of the on-site storm drain system (described below) on-site flows are adequately handled. A proposed 60-inch new storm drain line will intercept flows from Watershed Area 1, thereby eliminating off-site flows of 77 cfs into the Graham Street system. The proposed 102-inch storm drain line (parallel to the existing 60-inch RCP in Graham Street) from Kenilworth south to "A" Street and then through the site will convey all off-site flows from Areas 2-4 (472.5 cfs). These lines will connect to a 120-inch storm drain line on-site which will connect to the Slater Pump Station via a RC box under the C05. These lines with their flow interceptions eliminate the existing deficiencies in the Graham Street storm drain.

The above improvements have been required as mitigation for the proposed project. Implementation of these improvements will mitigate proposed drainage impacts to a less than significant level.

Flooding

The proposed project is located within a flood hazard area. Due to the location of the project site within the A99 zone which is not subject to NFIP development standards and the results of the Hunsaker & Associates Channel Inundation Study, significant flooding impacts to the project are not anticipated. The results of the Channel Inundation Study indicate that under the future with project condition, no change occurs in the current condition of the channel upstream of Graham Street. Additionally, implementation of Mitigation Measure 1 which required the above discussed drainage improvements (including improvement to C05 along the site) will further

reduce any potential flooding impact to a level less than significant. ***Additionally, please refer to Section 6.7 to Section 6.10, which includes the updated hydrologic study, "FEMA Detailed Flood Insurance Study" prepared by Exponent.***

Water Quality

The proposed project has the potential to result in a long-term impact on water quality due to the addition of pollutants typical of urban runoff. Volatile solids in urban runoff can originate: from accidental spills or deliberate dumping of lubricating oils or fuel oils; from emissions of engines during normal operations such as vehicle exhaust particulates or drippings of crankcase oil; from dustfall or rainout of atmospheric particulates; from spilling of crude or refined petroleum products; from leached or eroded pavement; from natural seepage on land; or from natural biogenic sources. The proposed project has the potential to result in an impact on water quality due to the addition of volatile solids to the runoff.

Stormwater flows from the future buildout of the residential project will be subject to the NPDES permit process. Through the NPDES Permit process, the City currently requires contributors to non-point runoff pollution to establish Best Management Practices (BMPs) to minimize the potential for pollution. Under this program, the developer is responsible for identification and implementation of a program of BMPs which can include special scheduling of project activities, prohibitions of certain practices, establishment of certain maintenance procedures, and other management practices to prevent or reduce the pollution of downstream waters. Typical elements of such a BMP program would include addressing the use of oil and grease traps, detention basins, vegetated filter strips, and other common techniques in order to preclude discharge of pollutants to local storm drains and channels. Mitigation Measures 2 and 3 will reduce potential water quality impacts to a less than significant level.

CUMULATIVE IMPACTS

The proposed project, in conjunction with other past, present, and reasonably foreseeable future projects will result in a cumulative impact related to flooding. The project's incremental contribution to this impact can be mitigated to a level less than significant. Water runoff will cumulatively increase due to the introduction of impervious surfaces. The proposed mitigation measures will reduce the project's incremental cumulative impact to a level less than significant.

Buildout of the proposed project in conjunction with future related projects will incrementally contribute to a cumulative increase in the total amount of surface runoff erosion and water quality impacts. Construction related activities that require grading and vegetation removal will increase runoff, causing greater erosion and downstream siltation. Implementation of proposed mitigation and standard City policies and requirements will reduce the project's incremental contribution to cumulative impacts to a level less than significant.

STANDARD CITY POLICIES AND REQUIREMENTS

A. Prior to issuance of building permits, a grading plan shall be submitted to the Department of Public Works for review and approval (by issuance of a grading permit). A plan for silt control for all water runoff from the property during construction and initial operation of the project may be required if deemed necessary by the Director of Public Works.

B. Prior to issuance building permits, an erosion control plan shall be submitted to Public Works Department.

C. All applicable Public Works fees shall be paid.

MITIGATION MEASURES

1. Prior to the issuance of building permits, the project applicant shall implement conditions of the Public Works Department regarding storm drainage improvements which shall include, but not be limited to:

   - Construct the necessary storm drainage improvements (identified on Exhibit 42 within the EIR) to handle increased flows and intercept off-site flows.
   - Ensure that future building pads are placed at elevations suitable to withstand 100-year flood.
   - Construct the necessary improvements to the East Garden Grove - Wintersburg Channel (C05) along the site perimeter.

2. Prior to issuance of any grading permits, the applicant shall submit a "Notice of Intent" (NOI), along with the required fee to the State Water Resources Control Board to be covered under the State NPDES General Construction permit and provide the City with a copy of the written reply containing the discharger's identification number.

3. Prior to the issuance of the grading permits, the applicant shall provide a Water Quality Management Plan showing conformance to the Orange County Drainage Area Management Plan and all NPDES requirements (enacted by the EPA) for review and approval by the City Engineer. The plan shall reduce the discharge of pollutants to the maximum extent practical using management practices, control techniques and systems, design and engineering methods, and such other provisions which are appropriate.

LEVEL OF SIGNIFICANCE

With implementation of standard City policies and requirements and proposed Mitigation Measures 1, the potential impacts to drainage will be reduced to a level less than significant.

With implementation of standard City policies and requirements and proposed Mitigation Measures 1, the potential impacts associated with flooding will be reduced to a level less than significant.

With implementation of standard City policies and requirements and proposed Mitigation Measures 2 and 3, the potential impacts to water quality will be reduced to a level less than significant.

Implementation of proposed Mitigation Measures 1 through 3 and standard City policies and requirements will reduce the project's contribution to potential cumulative drainage, flooding, and water quality impacts to a level less than significant.

5.8 BIOLOGICAL RESOURCES

The information contained in this section is summarized from the results of a technical report prepared by Frank Hovore & Associates (FHA) December, 1997, and an updated wetlands delineation assessment by FHA and Tom Dodson (L. Kegarice, Dec. 1997). This delineation was performed at the request of the California Coastal Commission. These documents in their entirety are contained in Appendix G. This delineation focused on the 8.3 acres originally delineated by the EPA (1989) as jurisdictional wetlands within the 44.5-acre city parcel. This area was subsequently removed from wetland designation by the Army Corps of Engineers (ACOE) (1992) and reclassified as "Prior Converted Cropland" (May 20, 1992 correspondence from the Department of the Army).

EXISTING CONDITIONS

Study Methods

Sensitive biological resources present (or potentially present) on site were initially identified through a thorough literature review using materials from the following sources: U.S. Fish and Wildlife Service (1993, 1994, 1996, 1997), California Department of Fish and Game (CDFG) (1988, 1990a, 1990b, 1994, 1996a, 1996b, and 1996c, 1997), California Natural Diversity Data Base (CNDDB) (1992, 1995, reviewed 1997), and the California Native Plant Society (Skinner and Pavlik 1994). Standard field guides were used for field identification of resources, and a spectrum of appropriate literature resources pertinent to the project area or issues under consideration were also consulted.

Field Reconnaissance

FHA biologists visited the Shea Homes property in Huntington Beach ***and adjoining property in the County*** (Tent. Tract Map. No. 15377 ***and 15419***) on 23 November 1996, 17 December, 1996, 14 January 1997, 07 June 1997 and 20 November 1997. The initial visits were intended to assess the presence or absence of wetlands or wetlands-type habitat values on the parcel, per the findings of various prior delineations and observations.

The most recent visit was conducted with L. Kegarice (Tom Dodson & Associates), for the purposes of reviewing and formally updating the prior wetlands delineations relative to the presence/absence of the three (3) parameters of wetlands delineation standards, and to assess overall land and habitat conditions following a ± 5 months fallow time.

Plant species encountered during field surveys were identified and recorded, or samples were taken and conveyed to local arboreta or universities for determination. Scientific nomenclature and common names of plants used in this report follow Hickman (1993), or where not available in Hickman, common names are taken from Beauchamp (1986), Munz (1974), or Abrams (1923 and 1944) and Abrams and Ferris (1951 and 1960).

Wildlife species detected during field surveys by sight, calls, tracks, scat, or other sign were recorded. Expected wildlife usage of the site was determined according to known habitat preferences of regional wildlife species and knowledge of their relative distributions in the area. Scientific nomenclature and common names for vertebrate species referred to in this report follow Stebbins (1985) for reptiles and amphibians; American Ornithologists' Union (with supplements to 1997) for birds; Jameson and Peters (1986) for mammals.

Historic Land Uses Inferred From Aerial Photographs

A series of color or black and white aerial photographs, showing the site on 25 different dates from December, 1952 through March, 1995, was reviewed microscopically to evaluate historic land use, conditions and habitats on the Shea site. A distinction has been made between land within the City of Huntington Beach and the ± 5 acres of Orange County land which comprises the southwestern extension of the overall parcel. The City/County line passes through the property just southwest of the primary agricultural lands, and in none of the photographs is there any visible evidence of land cultivation within the Orange County parcel. The following summarizes FHA's subjective assessments of the land use patterns exhibited in these photographs.

- **12/26/52: City area:** The subject property lies within a larger cleared area, extending further to the north, south and east of the site boundaries. Agricultural cultivation, as inferred from corrugated substrates (either disked or tilled), covers most of the land surface within Huntington Beach, except in the easternmost tip of the property (now under Graham Street) and along the western margin, below the bluffs, where more natural-appearing vegetation is present (the type of vegetation cannot be deduced from the photograph). Vehicle tracks, trails and some small clearings are visible within this area. There is no constructed development on the off-site knoll top.
  County area: the 5 acre Orange County ("Orange County") parcel is indistinguishable, in terms of its surface features and relative contiguity with surrounding habitats, from land to the south and west, most of which appears to be marshland, with some minor flow swales visible. Three broad roads transect the overall area on N-S alignments, and there is only a narrow canal separating the lands west of the project site from the more extensive (and evidently more disturbed) Bolsa Chica system to the south.

- **3/24/59: City area:** Agriculture covers about the same extent of the area as in 1952; flooding is visible over most of the western portion of the site in this winter photo. A drainage swale, extending to the north from the site is evident. There is agriculture where the Kenilworth Street development is presently located. The off-site knoll top area is not yet developed.
  County area: The 5 acre Orange County parcel remains as it was in 1952.

- **1/31/70: City area:** The East Garden Grove - Wintersburg Channel has been constructed since the 1959 photo, with its alignment bisecting the original agricultural fields (still visible below the channel). The western portion of the site below the knoll is flooded, and the fields appear fallow, with a network of minor flow lines and depressions evident. The remnant marshland area is almost entirely within Orange County. A narrow area, approximately 25' x 250', between a farm road and the levee (which as cultivated in the 1959 photo) now exhibits patchy vegetation which may be pickleweed, although the areas has been permanently isolated from the larger marshlands of Bolsa Chica by the flood control channel. The Kenilworth tract and a portion of the off-site knoll top are now developed.
  County area: The 5 acre county parcel shows little evidence of activity or use. Most of the road system which formerly passed through the site was eliminated by construction of the East Garden Grove - Wintersburg Channel.

- **6/28/70: City area:** The entire 44 acre area, extending off-site up onto the knoll (but with the exception of the eucalyptus trees), has been recently tilled, with soil furrows narrow and cross-hatched.
  County area: The aforementioned clearing extends southwest into the 5 acres Orange County parcel, to the dirt access roadway crossing between the knoll and the channel. There also is a linear swath of disturbance visible as a white band across the middle of the vegetated area.

- **10/26/73: City area:** Heavy, curvilinear contour furrows are visible over the entire site except in an otherwise disturbed area in the southwestern corner. The furrows extend over the top of knoll, leaving only the eucalyptus trees undisturbed. Activities associated with a roadway traversing the southwestern corner of the site and crossing the channel appear to have cleared about one-half of the vegetation patch detected in the 1/31/70 photo.
  County area: The eastern portion of the 5 acre parcel exhibits substantial recent disturbance.

- **2/17/75: City area:** The entire site, including the off-site knoll, appears to have been recently tilled, furrows straight; stables now visible at foot of knoll.
  County area: Remnant vegetation in the 5 acre Orange County parcel appears to have recovered slightly from 1973 clearing.

- **12/28/76: City area:** Entire site (except SW corner) again appears to have recently been tilled and/or disced. A large pad of freshly-spread soils covers the southwestern corner area, just east of stables.
  County area: Evidence of vehicle entry (tracks), and vegetation appears very fragmented, with high degree of disturbance in eastern portion.

- **12/14/78: City area:** Agricultural areas appear to have been deeply plowed in diagonal pattern (SW/NE); standing water evident in low areas below eucalyptus grove, along alignment of shallow swale and within arena under construction near stables, surrounded soils with unidentified mottling effect.
  County area: No changes evident from prior conditions.

- **2/25/80: City area:** Fields appear to have been left fallow, but row lines now run east-west, so it has been re-tilled since 1978 photo; water standing in western portion. Arena site shows little evidence of use.
  County area: New vehicle intrusion evident, although effects on vegetation are not clearly discernible due to photo quality.

- **1/31/81: City area:** Fields and slopes are cleared and freshly tilled or disced. Arena has a visible fence around perimeter, and there are other graded features nearby (one rectangular, one elliptical); some water standing in low end of arena.
  County area: Area appears to have been lightly cleared; vegetation less evident than in earlier photos (due to photo quality).

- **2/19/83: City area:** Fields again appear recently plowed, in a diagonal pattern, and western end appears saturated below eucalyptus grove. The arena appears more developed, and has a trench (?) around it; numerous "spots," which may be piles of fill or other material are apparent in the area between the arena and channel.
  County area: Grading and development more extensive on knoll top off-site, and condominiums being constructed on land north of the eastern knoll margin.

- **3/19/86: City area:** Agricultural field area completely cleared to open soils, with heavy diagonal till lines, some evidence of standing water north of stables; off-site knoll not disked; activity around stable and arena areas more extensive, with piles of fill (if that is what they were) no longer evident, perhaps having been spread on site.
  County area: Vehicle activity and some surface clearing evident in eastern portion of 5 acre parcel, possibly removing a small area of patchy vegetation.

- **1/9/87** and **1/21/87: City area:** Agricultural fields appear evenly vegetated (crops?), with east - west till lines in first photo, new clearing and grading across lower 1/3 of fields and onto knoll on 21st.
  County area: Area heavily used in both photos, with abundant evidence of vehicles and grading; some small structures placed in eastern end of site, apparently part of stable expansion.

- **1/24/88: City area:** Fields entirely cleared and disked, with cross-hatched tilling lines visible, except for a small rectangular area along the southern margin, where mottled vegetation formation is present.
  County area: Activity around arena and eastern portion of 5 acre site is more extensive and appears to have been expanding steadily since 1986.

- **1/30/89: City area:** Slopes and field area recently disked, with multiple turn-around lines visible across center of field; development around arena even more extensive, with buildings, parking areas and three smaller arenas visible.
  County area: No change in shape or extent of disturbance within vegetation patches; area of disturbance around stables extends into the 5 acre Orange County parcel.

- **3/15/90: City area:** Field and slope area shows evidence of disking since 1989 photo, as alignment of furrows has changed, but Spring weed growth has covered most of surface, except along lower margin, where disturbance or soil deposition has kept substrate patchily clear.
  County area: No change in shape or extent of vegetation from previous photo.

- **1/14/91: City area:** No evidence of clearing or grading since 1990 photo, and most of the structures and activity areas around arena site are gone or appear abandoned. Vegetation on fields appears thin, some shrub cover evident.
  County area: No significant change in shape or extent of development or disturbance to vegetation since previous photo.

- **1/8/92** and **1/24/92: City area:** Fields appear vegetated, and there are no recent till lines evident. Activity area around stables and arena is still extensive, but photos do not show facilities clearly; areas appears largely to have been abandoned.
  County area: Eastern end of area bare where disturbed in prior years.

- **1/3/93** and **5/14/93: City area:** Field appears to not have been tilled recently, but vegetation present is thin and patchy, with shrubs evident along southern portion. No water visible. The second photo is the only one taken in late Spring. Agricultural areas patchily vegetated, some larger shrubs evident, and no till lines visible. Arena appears abandoned, stables and disturbance footprint retracted somewhat.
  County area: Slight increase in density of patchy pickleweed vegetation formation (compared with 1980s) in western portion.

- **1/3/94: City area:** Vegetation on fields and slopes has been cleared since 5/14/93 photo, with soils exposed over most of the area; arena and stable areas also appear to have been lightly cleared.
  County area: Vegetation patches easily detectable by the characteristic "rusty" coloration of the pickleweed.

- **1/26/95, 1/28/95** (combined for purposes of analysis) and **3/27/95: City area:** Fields appear to have been disced in January photos, but probably several months earlier, as some shrubs are visible, although less extensively arrayed than in 1993. Area appears very wet, the arena is overgrown with weeds and there is little sign of use around the stables. March photo shows a slight decrease in the extent of standing water, no change in field condition or cover.
  County area: Vegetation patches difficult to assess due to darkness of photos, but no evidence of changes in extent or shape from previous photo.

Conditions encountered during the first three field surveys are similar to those exhibited within the 1992 through 1995 photographs, with little or no detectable change in the extent or degree of disturbance to landforms or to the remnant pickleweed marshland patch. The term "marshland" used to describe these vegetation fragments reflects the apparent origin of the remnant habitat, as its condition at the time of the visit was severely degraded, and the site no longer receives sufficient natural hydrology to be considered a functional coastal marsh ecosystem. Discing in the Orange County portion of the site prior to the June, 1997 visit completely removed all traces of the surface vegetation except larger trees, and a ± 10 foot wide strip of mostly ruderal herbaceous plants, with a few pickleweed intermixed, growing beneath an elevated oil pipeline which passes through the bottomland area.

General Habitats

City Parcel

There are virtually no natural or naturalized habitats within the 44 acre Huntington Beach portion of the site. A shallow depression formed by the abandoned arena occasionally contained temporary accumulations of rainfall or nuisance water, attracting some foraging waterfowl, but not forming natural habitat.

County Parcel

Two small, contiguous areas of probably remnant coastal saltmarsh-type vegetation were situated in a bottomland remnant of the original marshlands from which the site was created. Most of this area north of the East Garden Grove - Wintersburg Channel was removed, confined

and altered by construction of the channel and berm. The remaining area is bisected by an elevated ~~oil~~ ***gas*** pipeline, and was used casually as a dumping site for trash (notably many large tires and sections of telephone poles). The two pickleweed fragments, which together were substantially less than one acre ~~(.2 acres according to EPA (1989)~~ ***(50' by 150' or about .2 acres according to the biologist's initial field survey estimate)*** ~~digitized delineation contained in certified EIR 551)~~, were completely isolated from any other such habitat by the knoll, the channel and development. Nothing remains of these patches following the most recent disking and clearing of the site. ***It should be noted that the delineated "pocket wetlands" shown on the EPA map (refer to Draft EIR Appendix G) within the Orange County parcel do not overlay the area of patchy pickleweed.***

The nearest intact, ecologically-functional coastal marshland and surface water ecosystems lie off-site to the south and west, beyond where the knoll intersects the flood control channel, or south of the channel, within the main Bolsa Chica wetlands. There now are no tidal inflows to the proposed project site, and because the East Garden Grove - Wintersburg Channel bottom lies lower than landforms on the site, there is little possibility of subsurface accretion of water from the Bolsa Chica wetlands. Historic freshwater runoff to the site, which historically created topographical relief and carried in nutrients and organic debris, have been eliminated by surrounding development and off-site conveyance of stormwater flows.

Vegetation

City Parcel - Agricultural Fields (including the *EPA* delineated 8.3 Acres)

Level, disced portions of the site, including the 8.3 acres, have been under cultivation or maintenance continuously since at least 1952. As surface vegetation regrows following discing, the fields exhibit a relatively homogeneous ruderal vegetative cover, dominated over most of the surface by extensive areas of crabgrass (*Cynodon dactylon*) and an even cover of cheeseweed (*Malva parviflora*), with scattered patches of other non-native grasses and herbaceous subshrubs (pigweed, *Chenopodium album*; wild radish, *Raphanus sativus*; curly dock, *Rumex crispus*; common purslane, *Portulaca oleracea;* narrow-leaved iceplant, prob. *Mesembryanthemum* sp.; peppergrass, *Lepidium latifolium*; Australian saltbush, *Atriplex semibaccata*). A species of nutsedge also formed low mats where sandier soils were present; it was tentatively identified as either *Cyperus rotundus*, stated by Tucker (1993, in Hickman, *The Jepson Manual, higher plants of California*) as "Often considered the world's worst weed.," or *C. esculentus*, characterized by Tucker as a "worldwide weed." Although both are classified as facultative wetlands species (Reed, 1988, *National list of plant species that occur in wetlands: California [Region O]*), they also are indicative of degraded conditions, being found most typically in "croplands, disturbed places." (Tucker, 1993, in Hickman, *loc. cit.*).

Native herbaceous species were infrequent in the agricultural field, comprised primarily of disturbance-tolerant taxa which have either persisted on-site or colonized areas where topsoils

have been less-thoroughly overturned. Scattered individuals of alkali heath (*Frankenia salina*), salt bush (*Atriplex triangularis*), sand spurrey (*Spergularia marina*), alkali mallow (*Malvella leprosa*) and alkali weed (*Cressa truxillensis*) were found in less-disturbed portions of the field, but nowhere did they form natural stands or create native habitat. Most plant species observed are tolerant of, or have affinities for, alkaline and saline soils, which would be expected given the probable historic geography of the site. Numerous subsites of soils and vegetation were examined within the 8.3 acre delineated area and across the agricultural field. Nowhere did FHA and L. Kegarice observe even remnant wetland resources or other natural habitats.

No trees or shrubs of any kind, native or otherwise, are present within the agricultural use areas, and the only subshrubs present during any of the site visits were tumbleweeds (*Amaranthus albus*) and Russian thistle (*Salsola tragus*) regardless of the length of time since disking.

County Parcel - Marshland Fragment

Historic aerial photographs clearly show that the Orange County portion of the property was formed from the upper margin of the Bolsa Chica marshlands, severed geographically by the construction of the East Garden Grove - Wintersburg Channel, and degraded repeatedly by off-site roadway construction, oil drilling and associated surface activities. All that remained on the project site were two very small patches of pickleweed (*Salicornia* sp.), in a low area immediately adjacent to the channel berm and horse stable parking areas. Habitat values within the two small pickleweed patches were essentially diminutives of those typically found within degraded portions of the Bolsa Chica wetlands: low, spreading cover dominated by pickleweed and saltgrass (*Distichlis spicata*), with a few shrubby rush (*Juncus* sp., prob. *balticus*) interspersed.

This type of habitat persists in a highly-degraded formation immediately west of the Orange County parcel, within oil fields. The pickleweed patches were very limited in overall extent and were highly-disturbed, but centrally each had a few square meters of fairly homogenous plant cover, with relatively few invasive non-natives. Neither fragment measured more than a few meters across, together encompassing about 50' x 150' (~~estimated and~~ ***or about*** .2 acres according to ~~EPA 1989 digitized delineation contained in EIR 551~~ ***the biologist's initial field survey estimate***), with their configuration having been determined and restricted over the years since the channel was constructed by patterns of land use and the spread of exotic tree cover. Activity along the eastern margin between 1970 and the early 1990s pushed the formation back from its greatest post-development extent in the 1950s, and it had not changed significantly over the past 20+ years (as determined from aerial photographs).

The remainder of the Orange County portion of the site supported only ruderal subshrubs, not considered to be remnant marshland habitat, densely overgrown with invasive gum trees.